REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 1 of 78 (312) 360 0080

FIG. 1

D

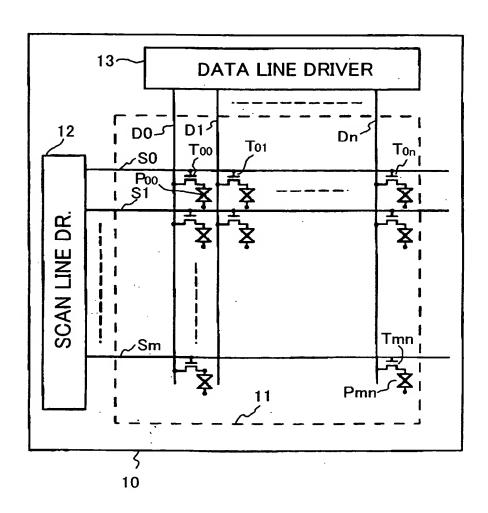
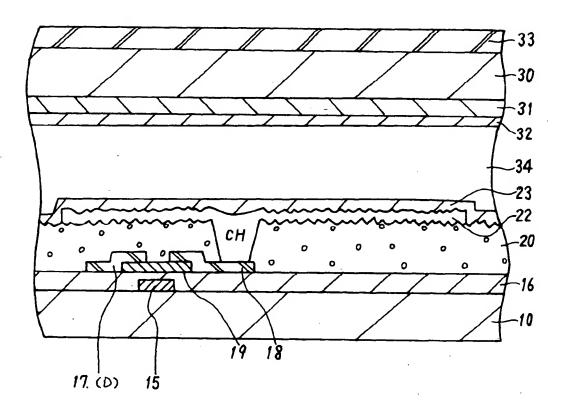
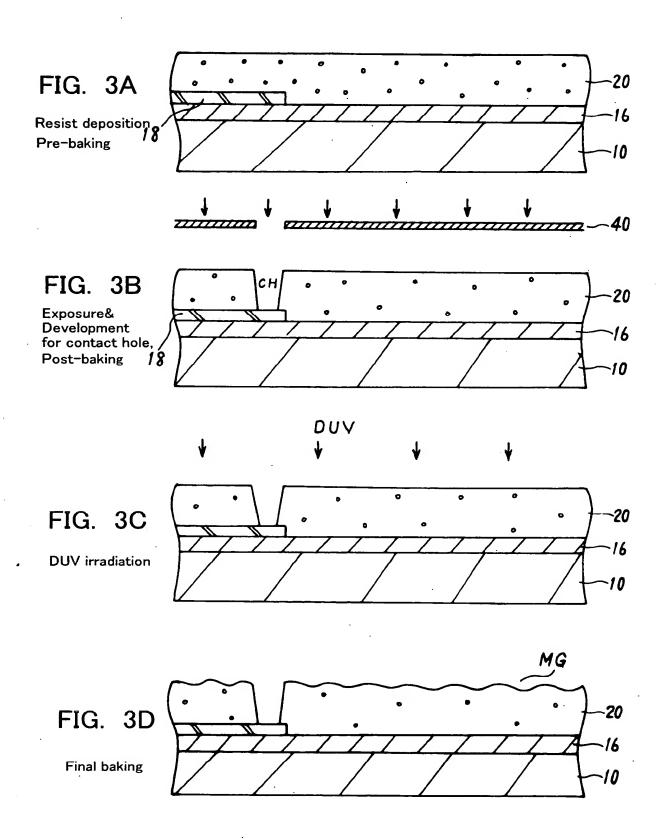


FIG. 2



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REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 4 of 78 (312) 360 0080

FIG. 4

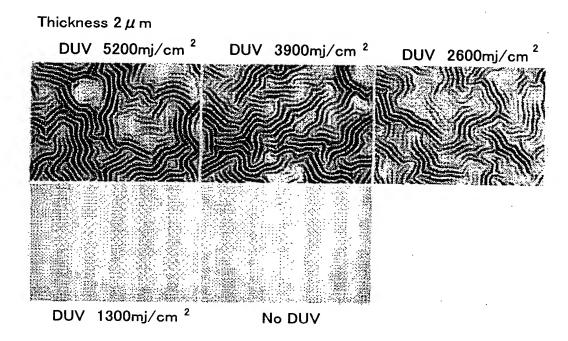
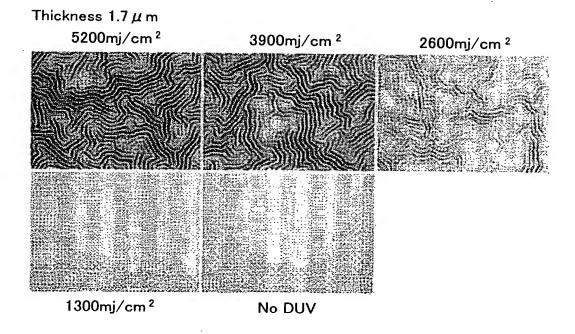


FIG. 5



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FIG. 6

Thickness 1.4 μ m

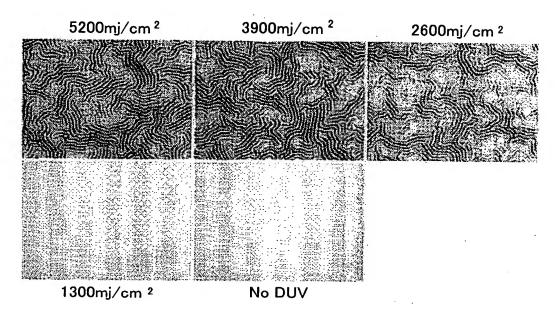


FIG. 7
Thickness 1.0 μ m

5200mj/cm² 3900mj/cm² 2600mj/cm²

1300mj/cm² No DUV

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FIG. 8A

Thickness 1.7 μ m

Average inclination angle k=13 $^{\circ}$ Height difference of undulation : 1.3 μ m

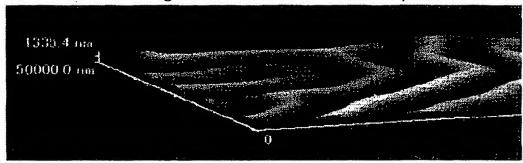


FIG. 8B

Thickness 1.4 μ m

Average inclination angle k=11 $^{\circ}$ Height difference of undulation : 1.1 μ m

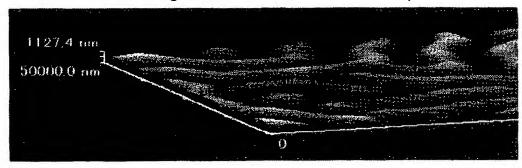
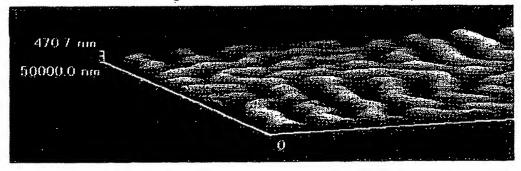
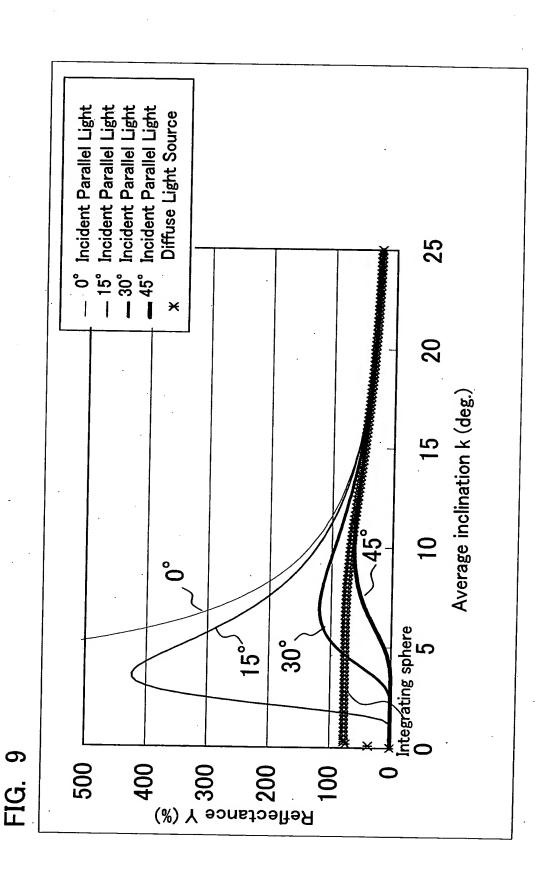


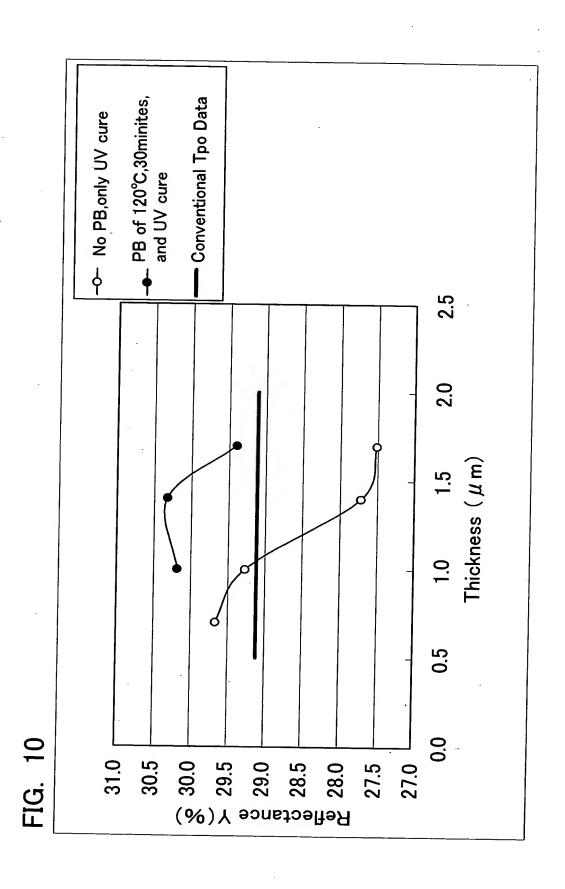
FIG. 8C

Thickness 1μ m

Average inclination angle k=8 $^{\circ}$ Height difference of undulation : 0.5 μ m







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FIG. 11A

Rough undulation

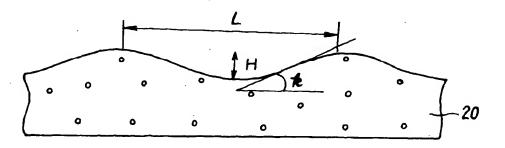
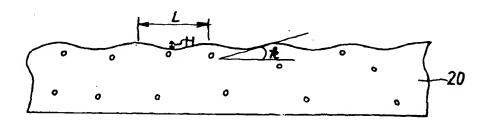


FIG. 11B

Fine undulation



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FIG. 12A



FIG. 12B



FIG. 12C

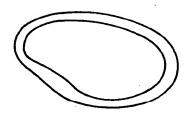
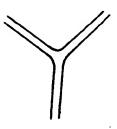


FIG. 12D



REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 11 of 78 (312) 360 0080

FIG. 13A

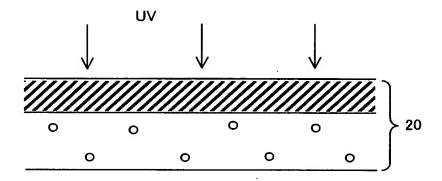
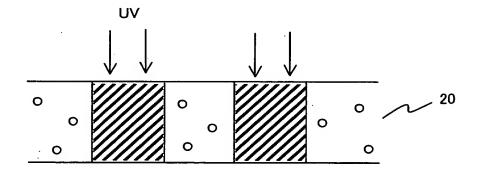
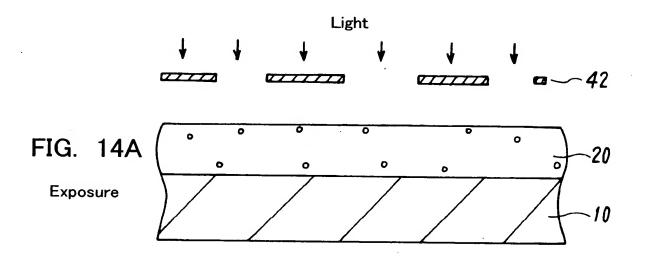
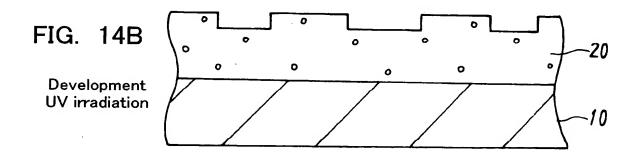


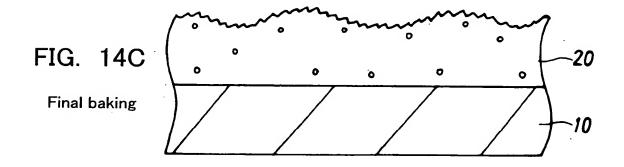
FIG. 13B

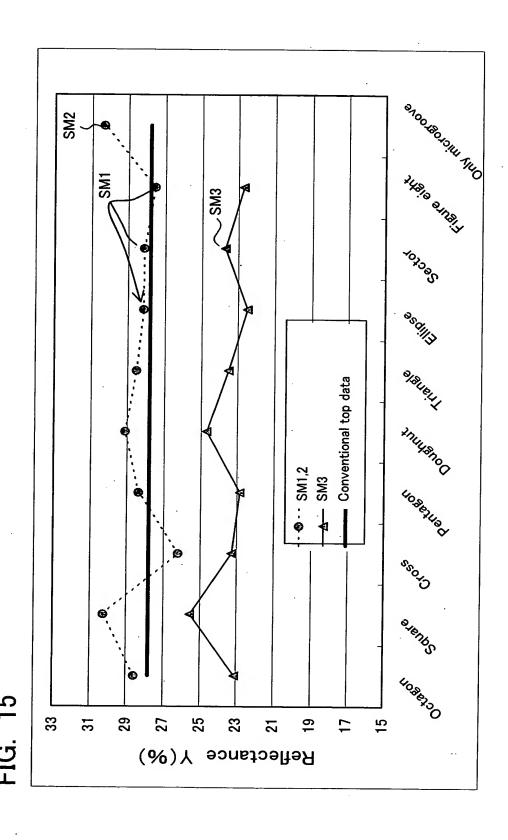


REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 12 of 78 (312) 360 0080



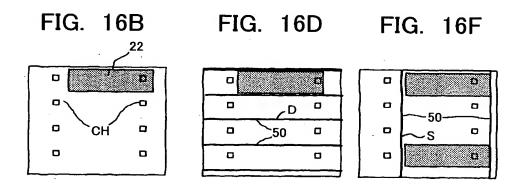




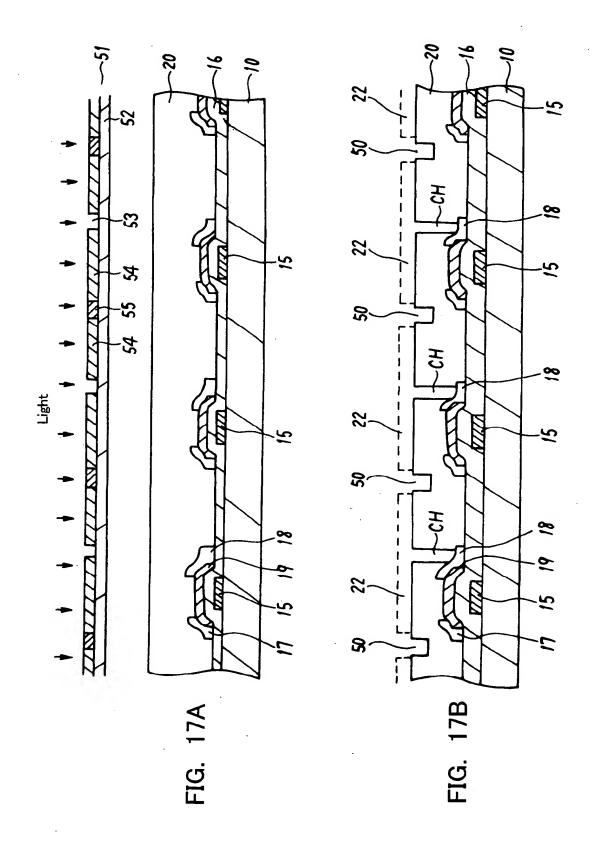


REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 14 of 78 (312) 360 0080

FIG. 16A FIG. 16C FIG. 16E

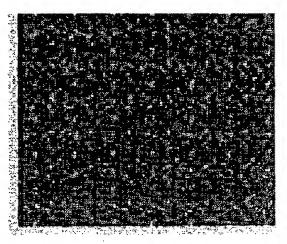


REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 15 of 78 (312) 360 0080



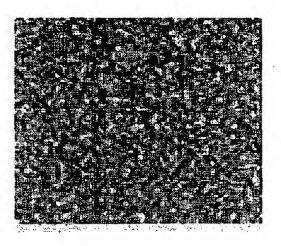
REFLECTION TYPE LIQUID CRYSTAL... oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 16 of 78 (312) 360 0080

FIG. 18A



with separation line

FIG. 18B



without separation line

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FIG. 19

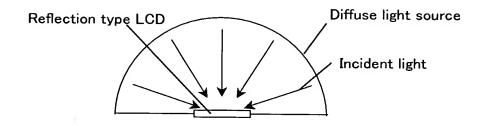
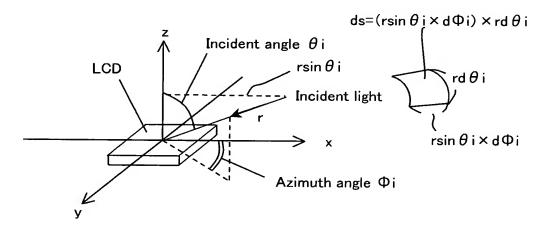


FIG. 20



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FIG. 21

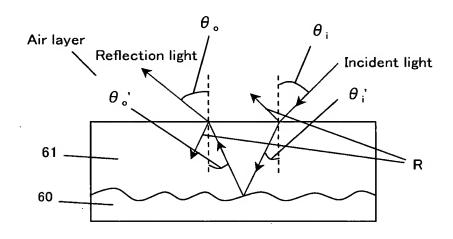
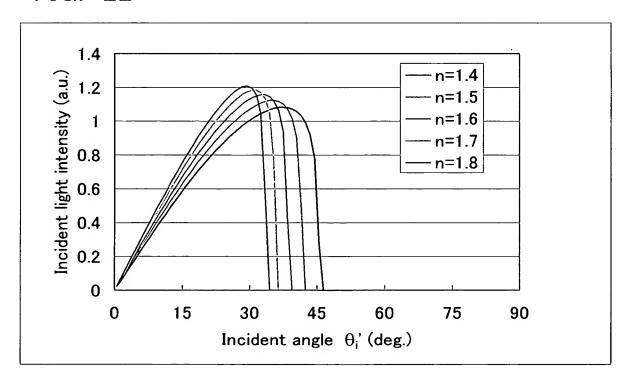


FIG. 22



REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 19 of 78 (312) 360 0080

FIG. 23

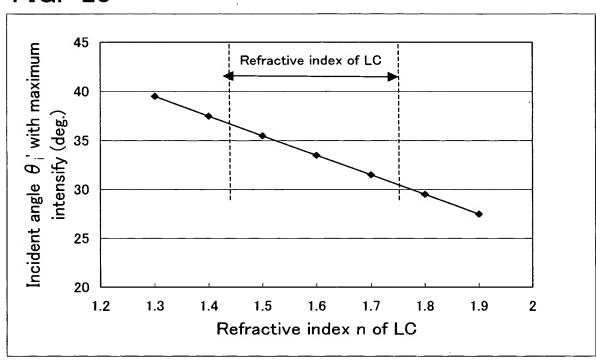
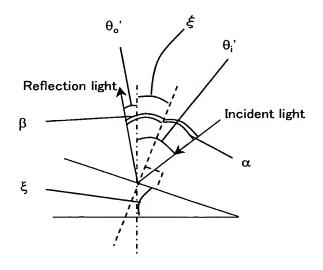


FIG. 24



REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 20 of 78 (312) 360 0080

FIG. 25

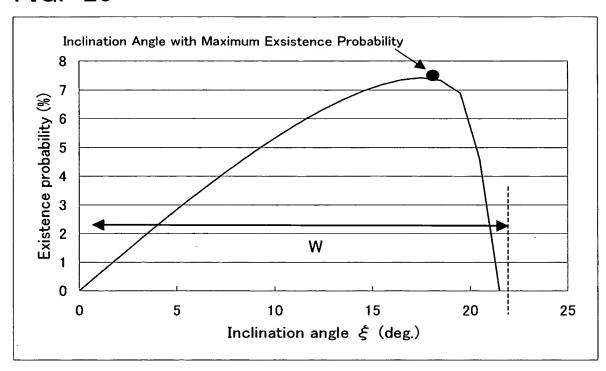
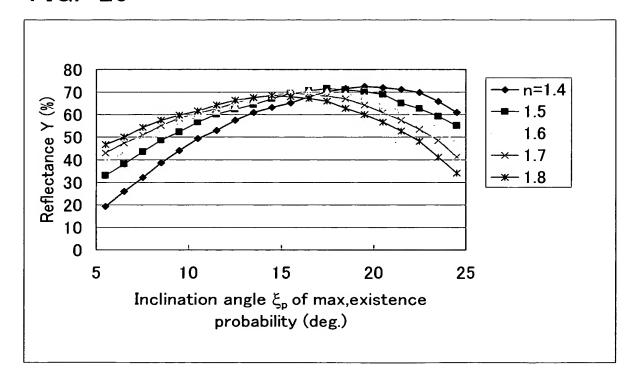


FIG. 26



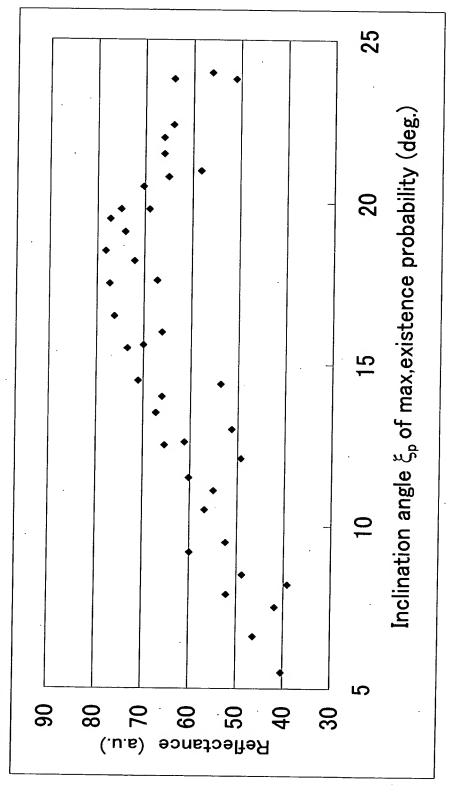
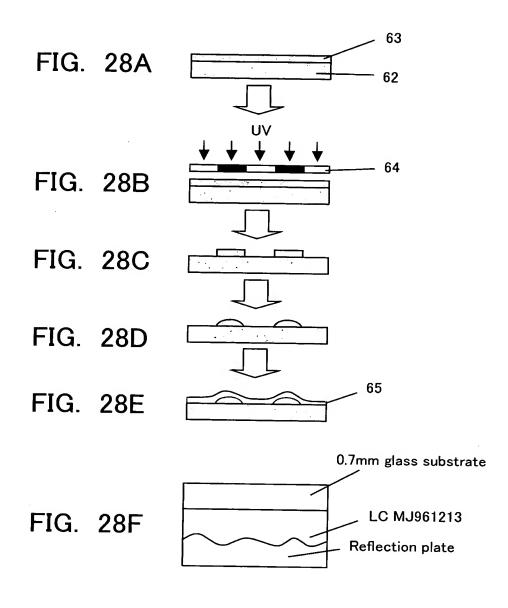


FIG. 27

REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 22 of 78 (312) 360 0080



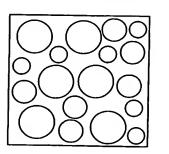
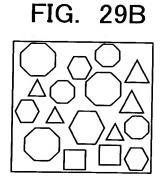


FIG. 29A



REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 23 of 78 (312) 360 0080

FIG. 30

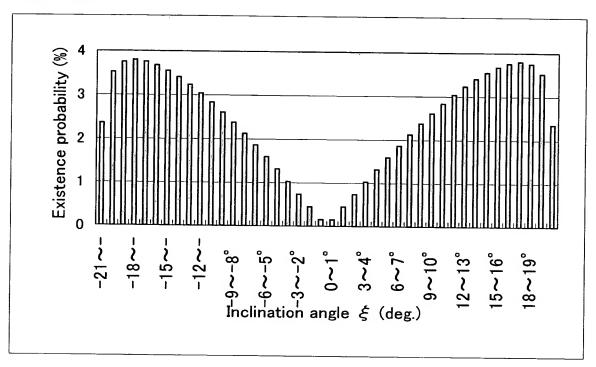
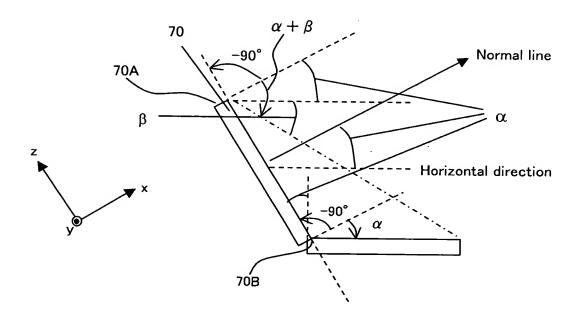


FIG. 31



REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 24 of 78 (312) 360 0080

FIG. 32

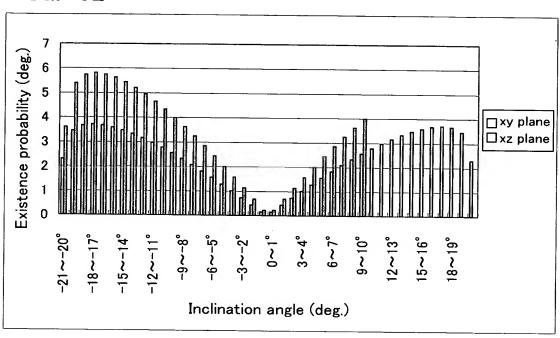
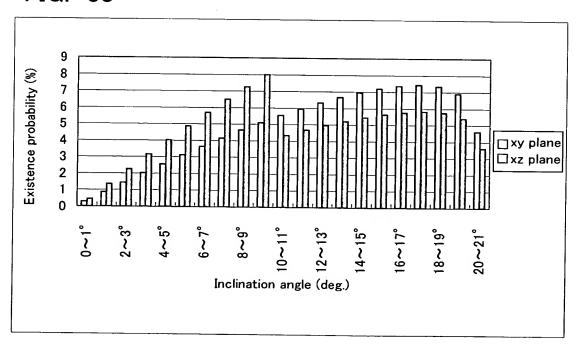
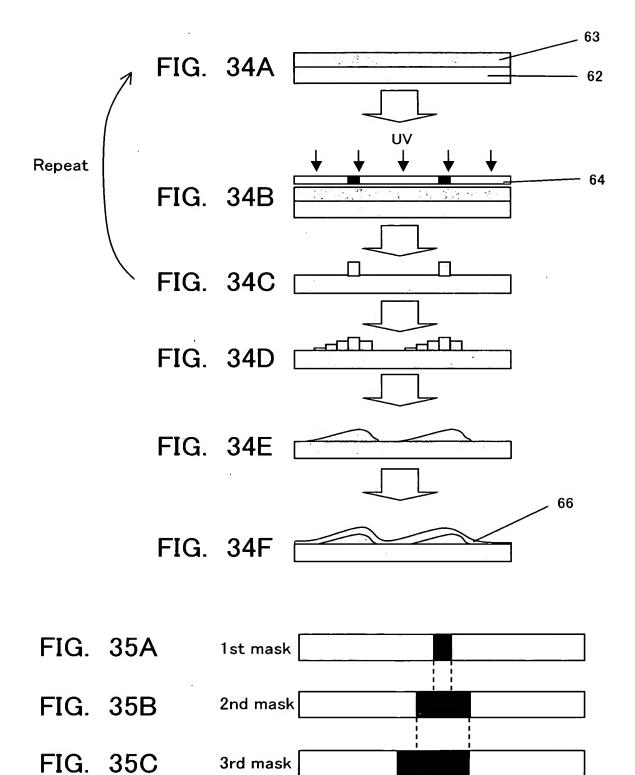


FIG. 33



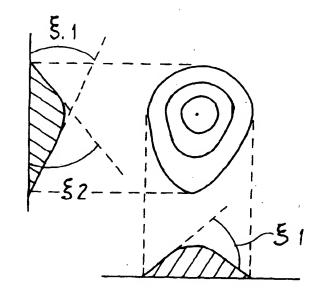


4th mask

FIG. 35D

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FIG. 36



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FIG. 37

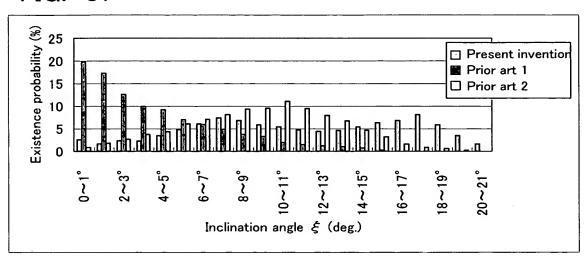


FIG. 38

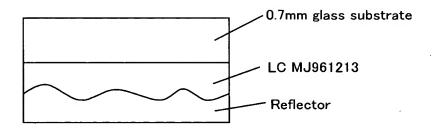


FIG. 39

Measurement result of reflectance

	Present invention	Prior art 1	Prior art 2
Reflectance	61%	31%	53%

Present invention: Existence probability of indication angle is maximum at 8° - 18°

Prior art 1 : Existence probability of indication angle is maximum at only 0°

Prior art 2 : Existence probability of indication angle is maximum at only 10°

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FIG. 40

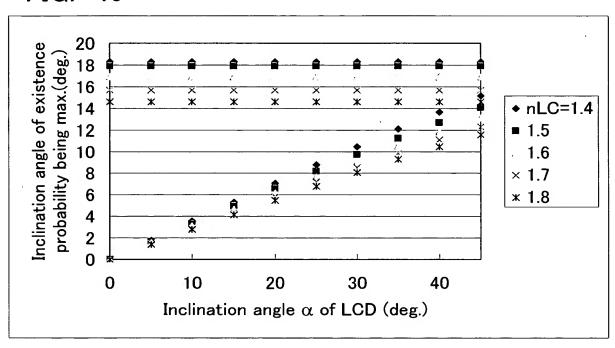
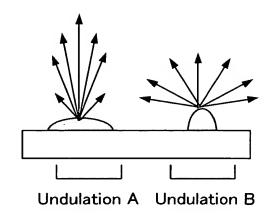
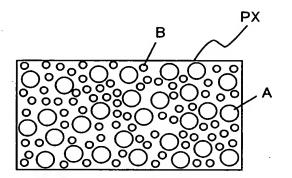


FIG. 41

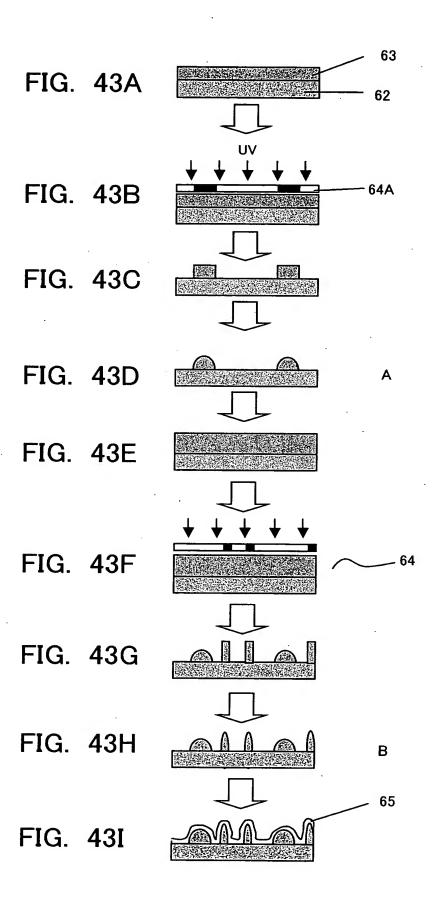


REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 29 of 78 (312) 360 0080

FIG. 42



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REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 31 of 78 (312) 360 0080

FIG. 44

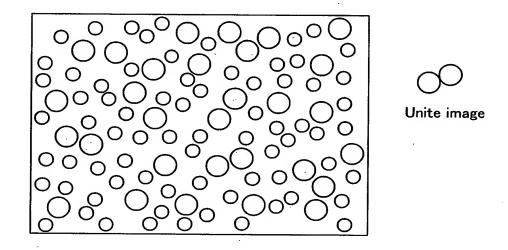
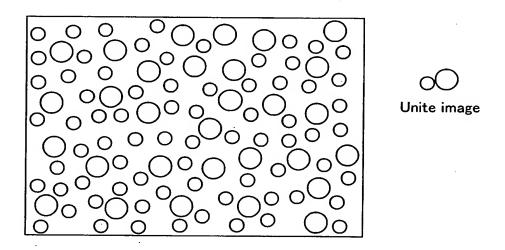
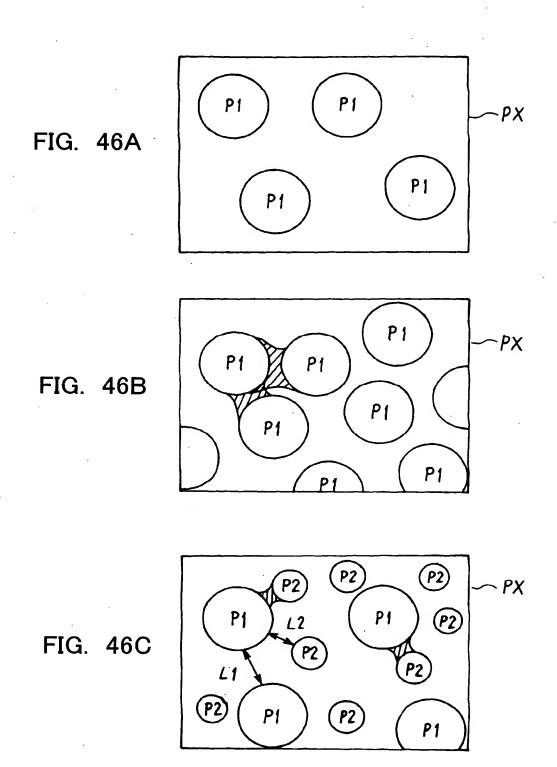


FIG. 45



REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 32 of 78 (312) 360 0080



REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 33 of 78 (312) 360 0080

FIG. 47

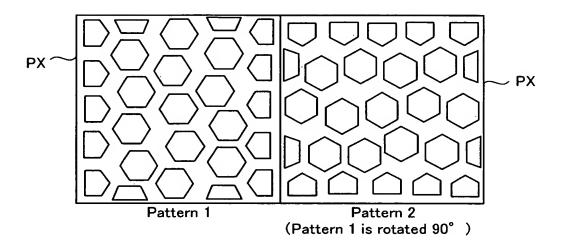
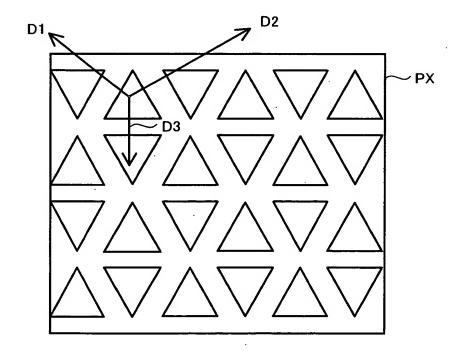


FIG. 48



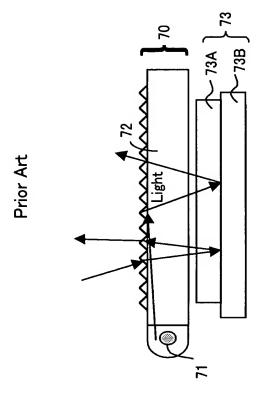
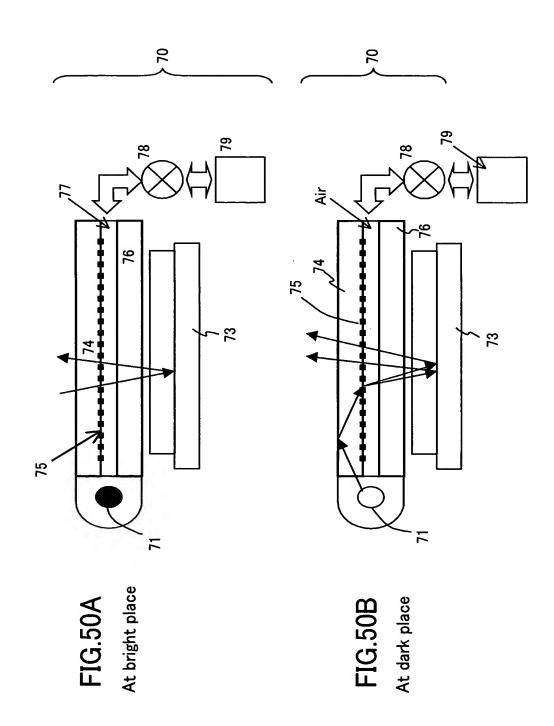


FIG.49

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REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 36 of 78 (312) 360 0080

FIG.51A
At bright place

8

NS S

8

73

9/

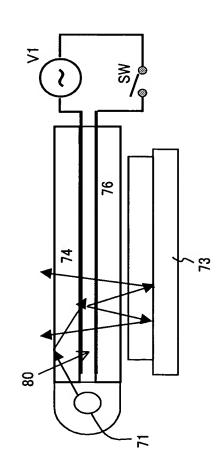
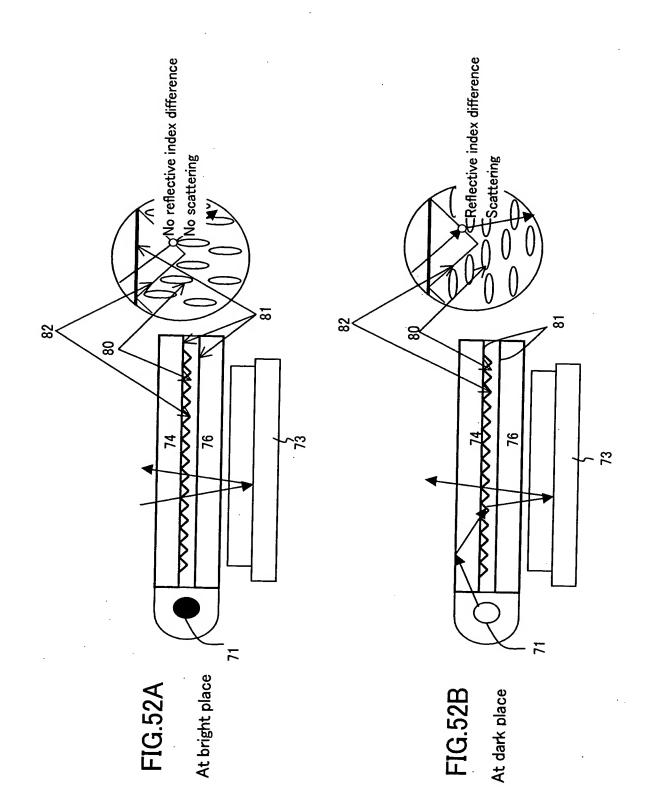
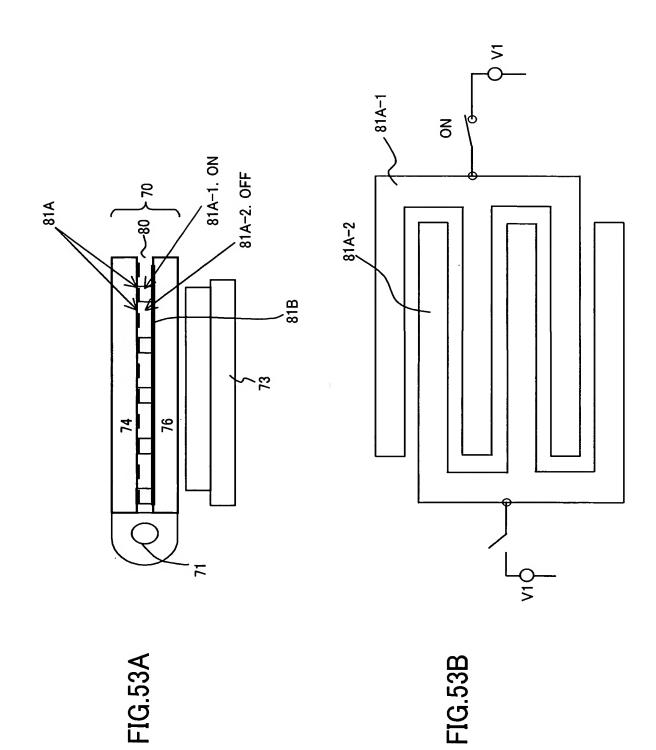


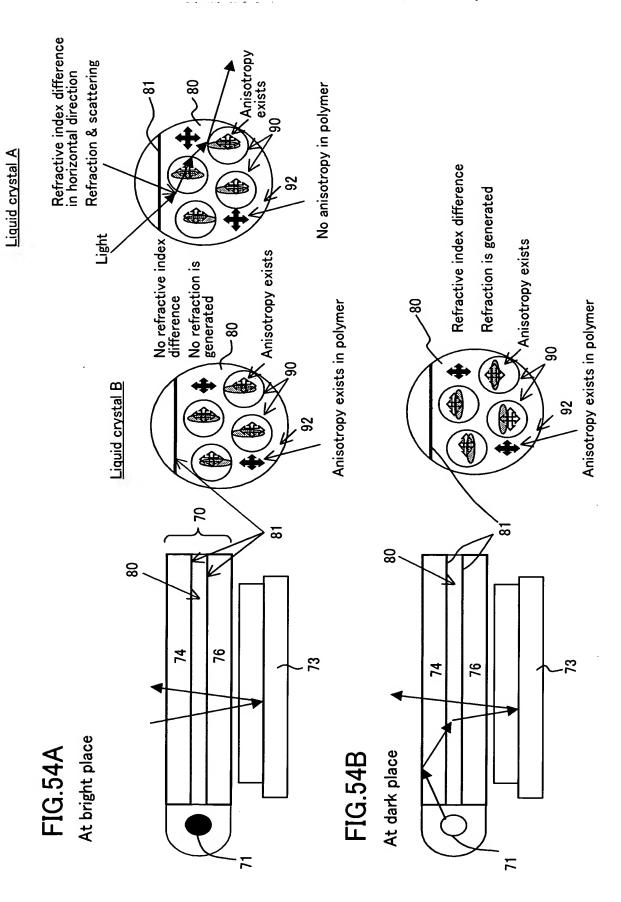
FIG.51B At dark place

REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 37 of 78 (312) 360 0080

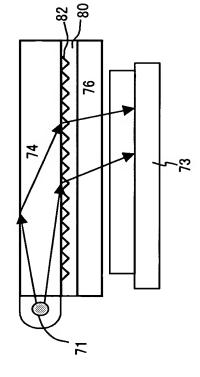


REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 38 of 78 (312) 360 0080





REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 40 of 78 (312) 360 0080



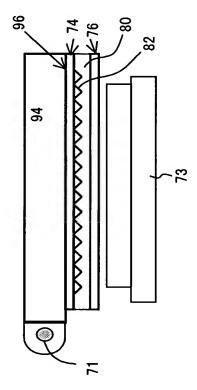
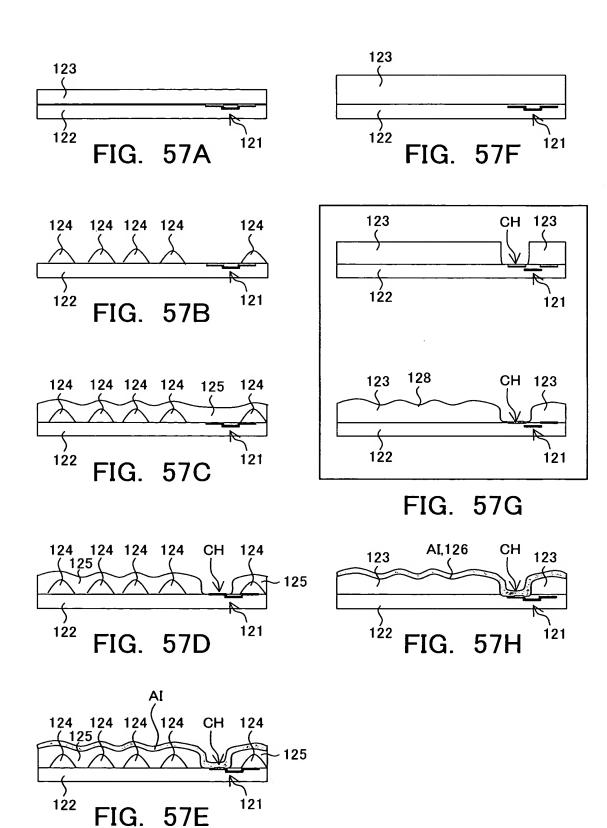


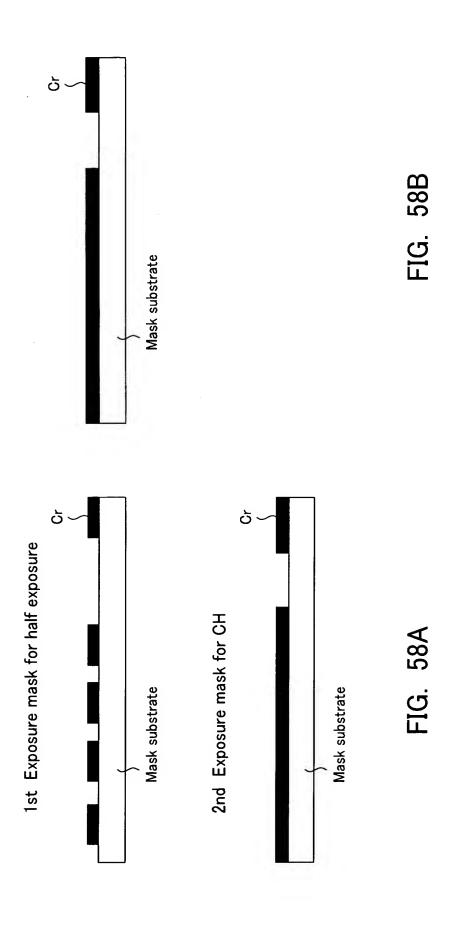
FIG.55

-IG.56

REFLECTION TYPE LIQUID CRISTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 41 of 78 (312) 360 0080

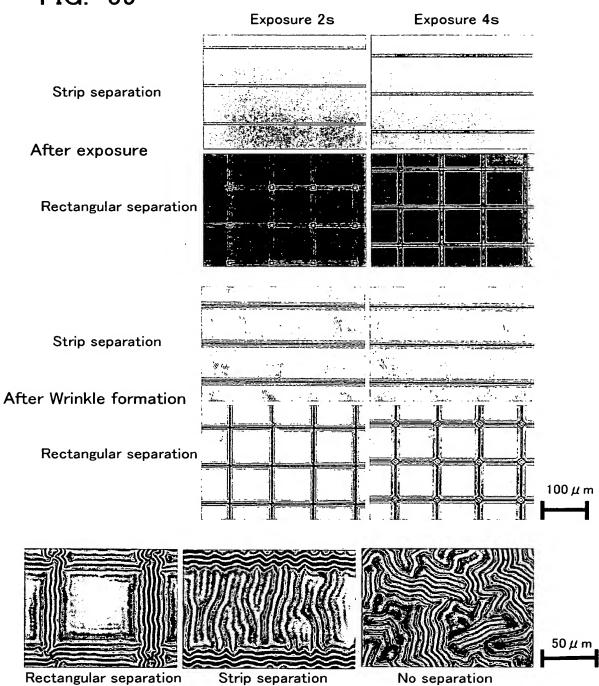


REFLECTION TYPE LIQUID CRISTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 42 of 78 (312) 360 0080



REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 43 of 78 (312) 360 0080

FIG. 59



REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 44 of 78 (312) 360 0080

FIG. 60

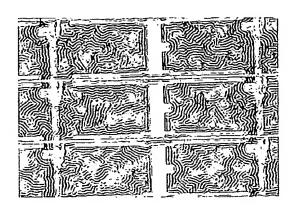
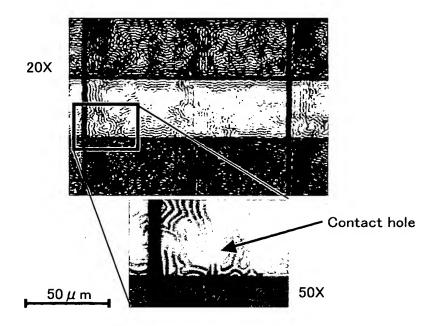
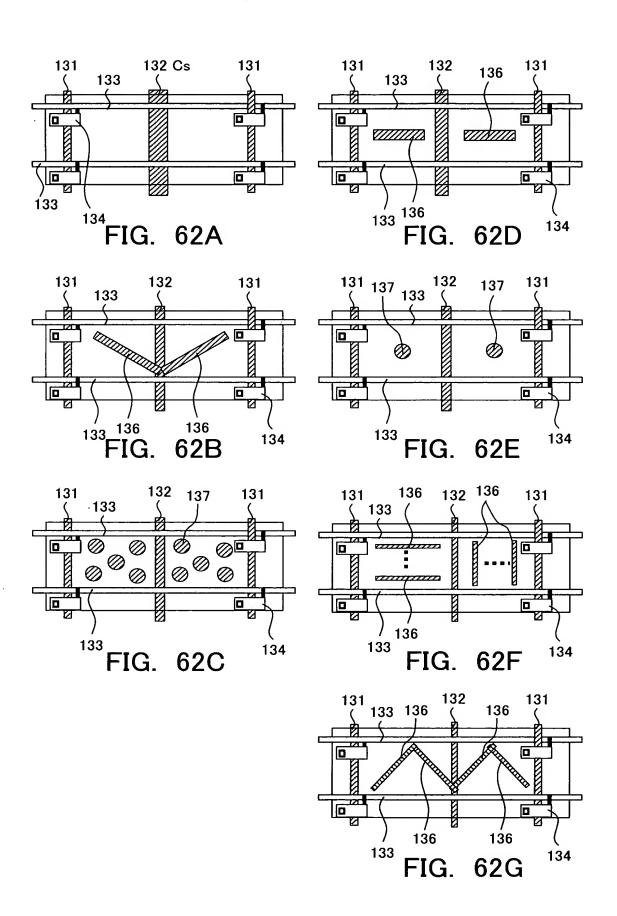


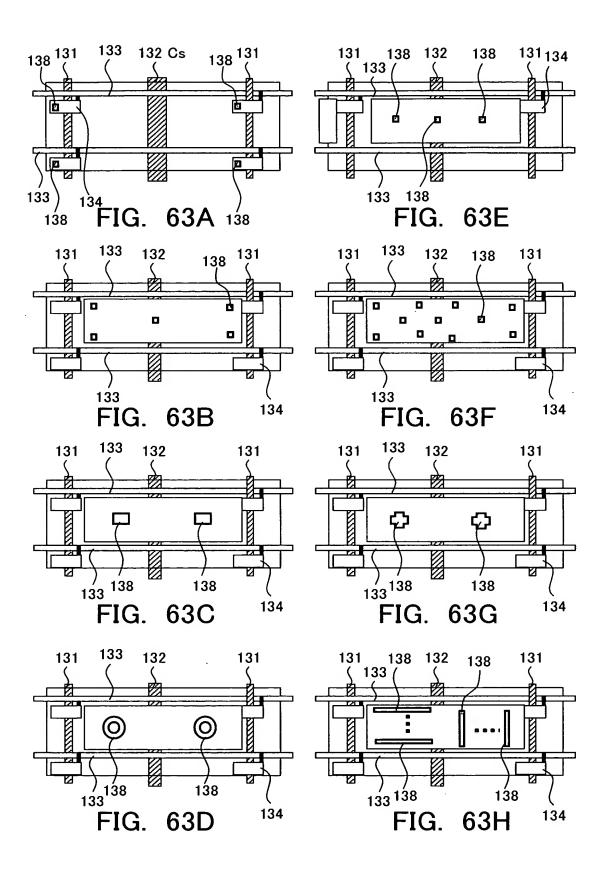
FIG. 61



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REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 47 of 78 (312) 360 0080

-101

FIG. 64

103 103 103 103 103 103

102

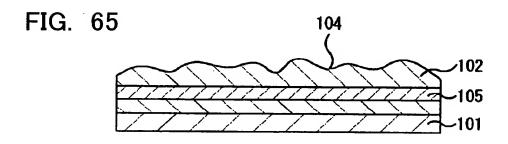


FIG. 66

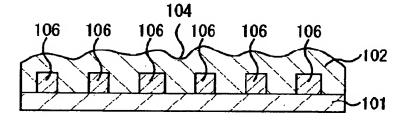
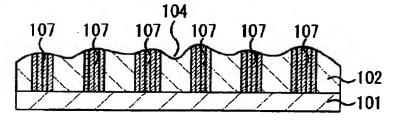


FIG. 67



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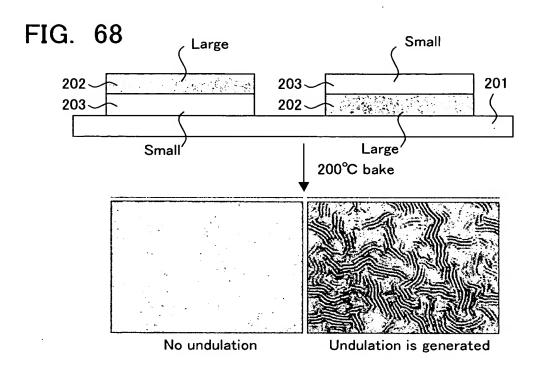
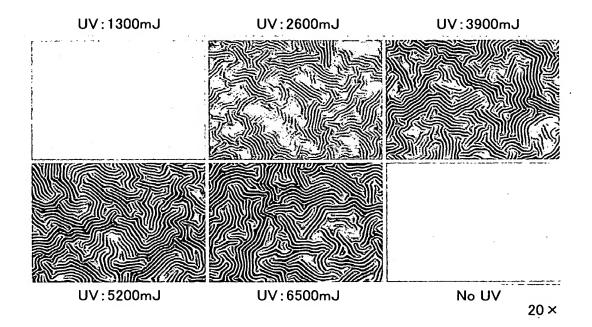


FIG. 69

FIG. 70

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FIG. 71



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FIG. 72

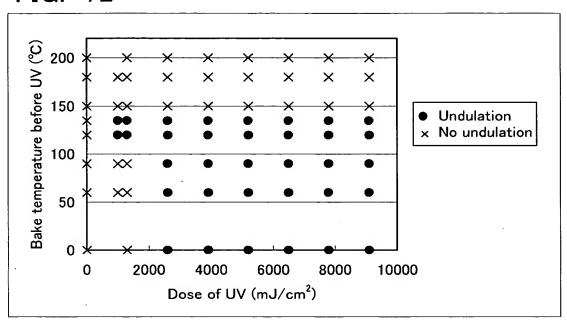
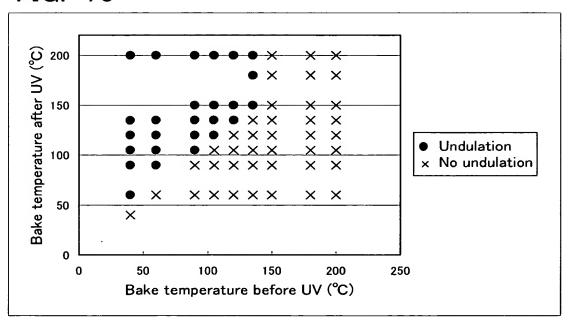


FIG. 73



REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 51 of 78 (312) 360 0080

FIG. 74

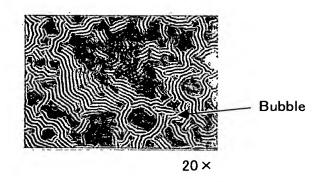
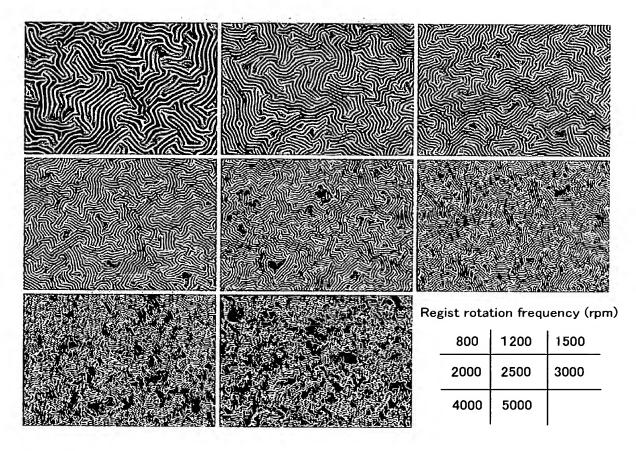


FIG. 75



REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 52 of 78 (312) 360 0080

FIG. 76

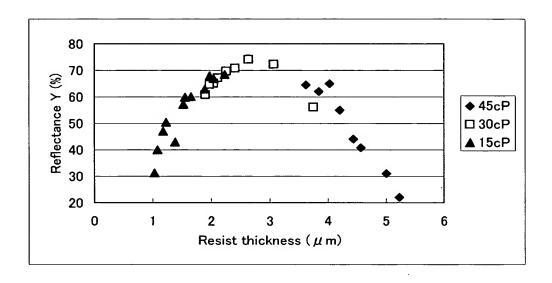
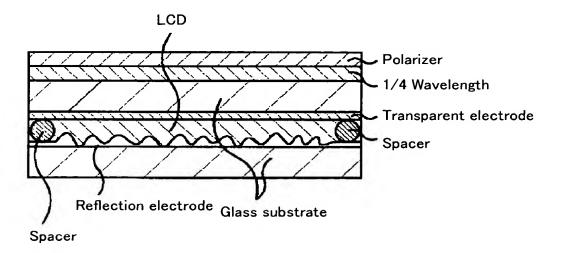


FIG. 77



REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 53 of 78 (312) 360 0080

FIG. 78

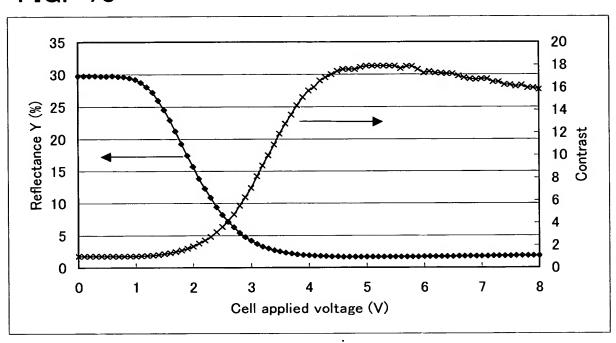
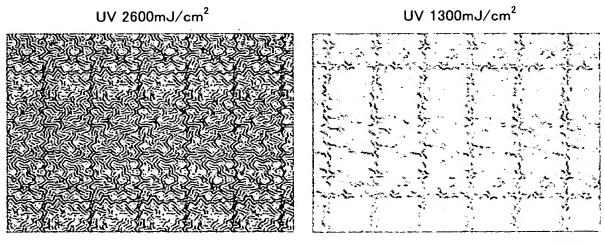


FIG. 79



REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 54 of 78 (312) 360 0080

FIG. 80A

FIG. 80B

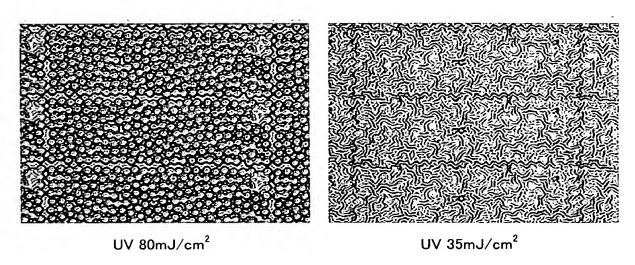
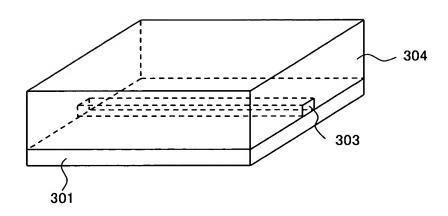
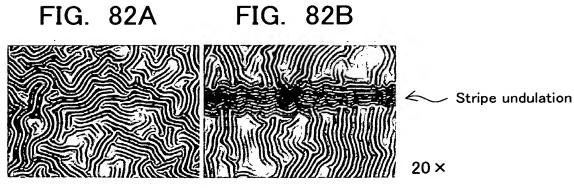
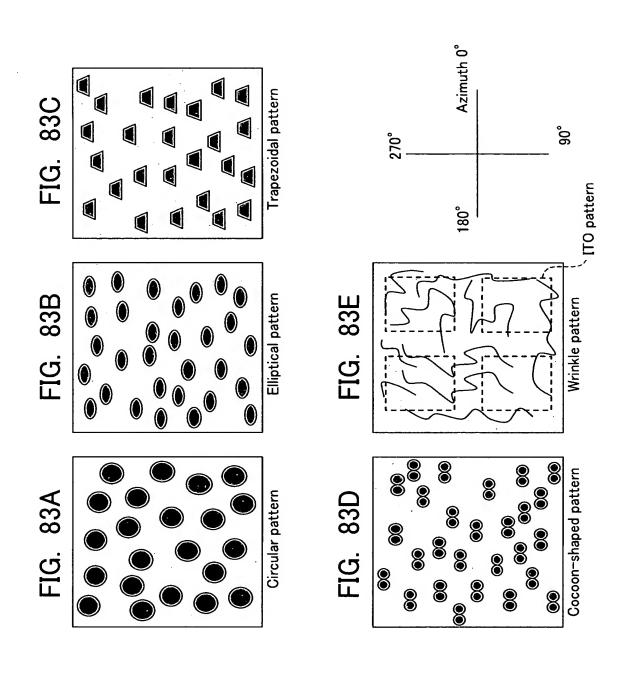


FIG. 81







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FIG. 84A

180 160 140 -45° Reflectance Y 120 100 80 60 40 20 -70 -60 -50 -40 -30 -20 Incident angle (deg.) Circle

FIG. 84B

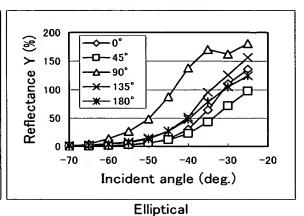


FIG. 84C

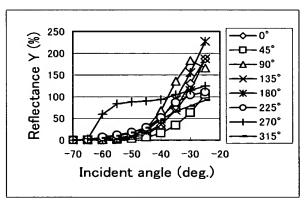
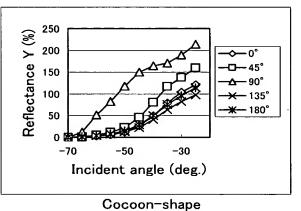
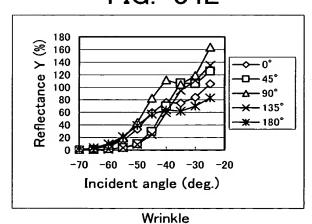


FIG. 84D

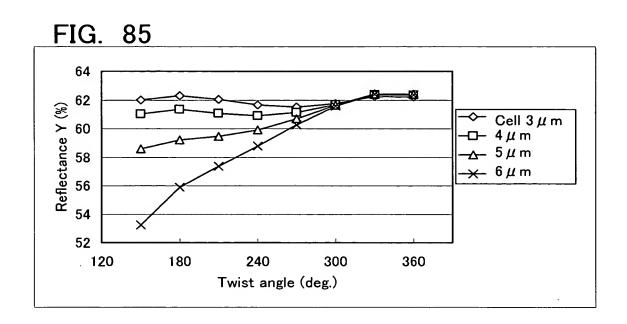


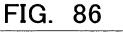
Trapezoidal

FIG. 84E



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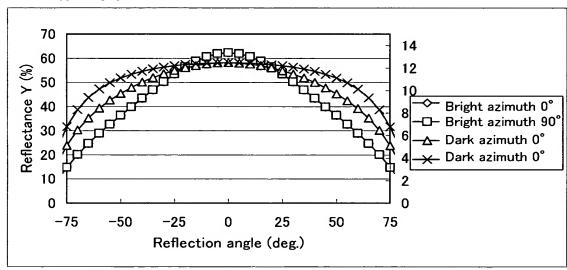
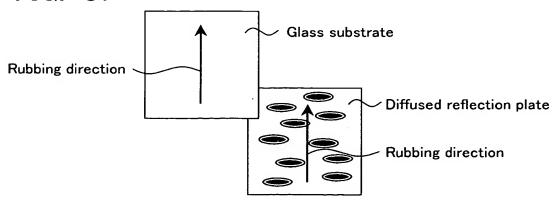


FIG. 87



REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 58 of 78 (312) 360 0080

FIG. 88

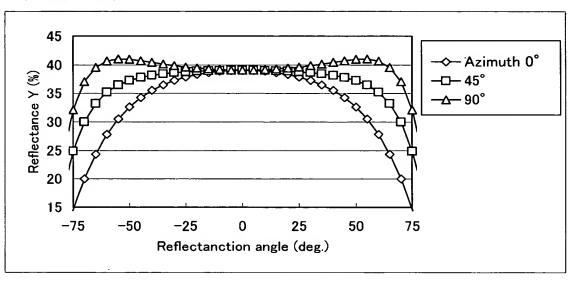
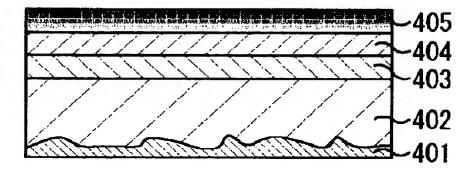
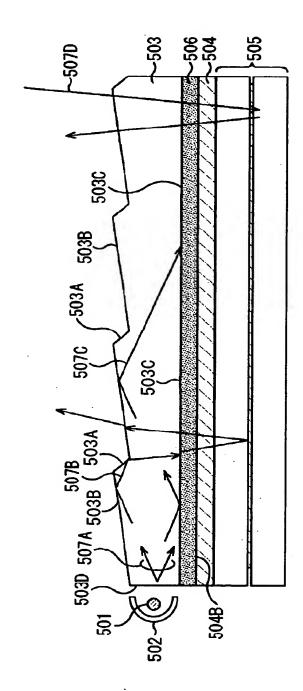
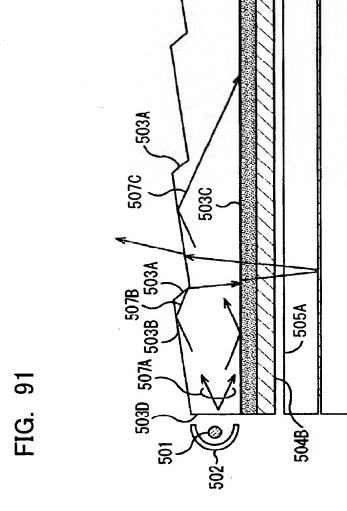


FIG. 89









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₹202

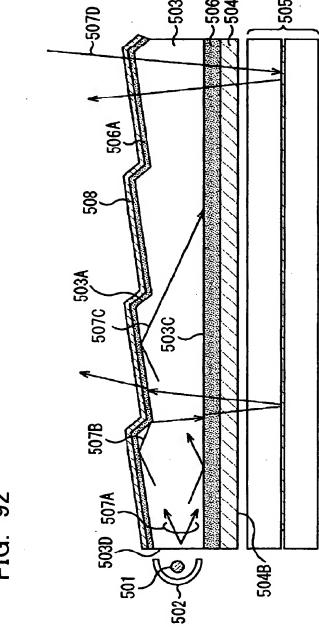


FIG. 92

REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 62 of 78 (312) 360 0080

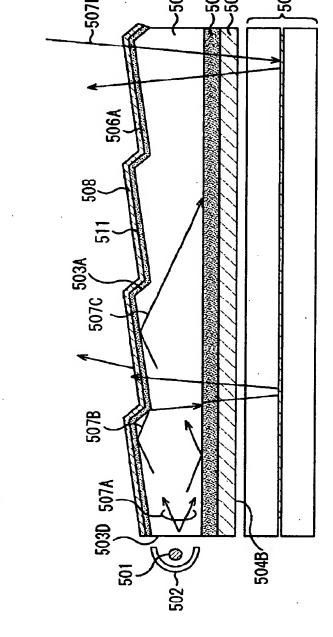
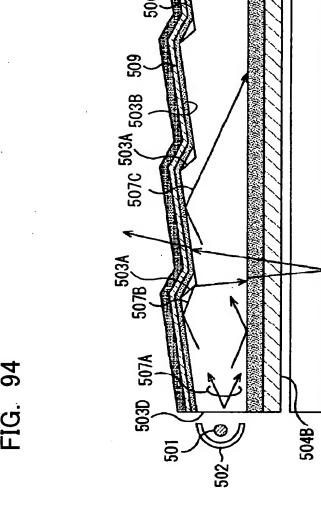
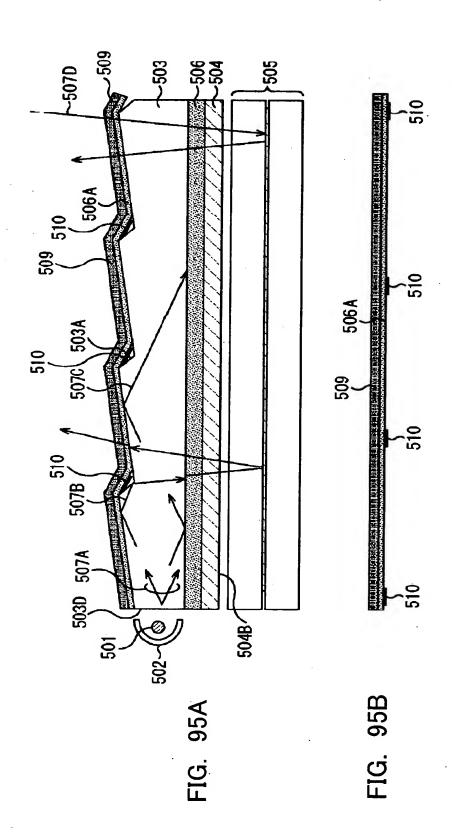
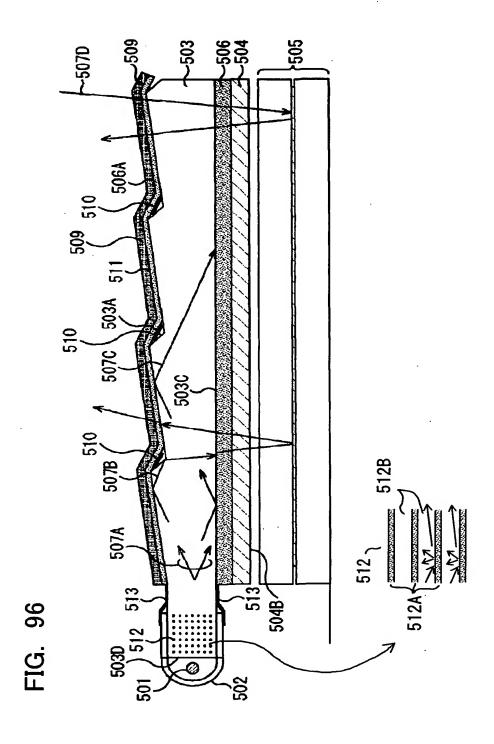


FIG. 93



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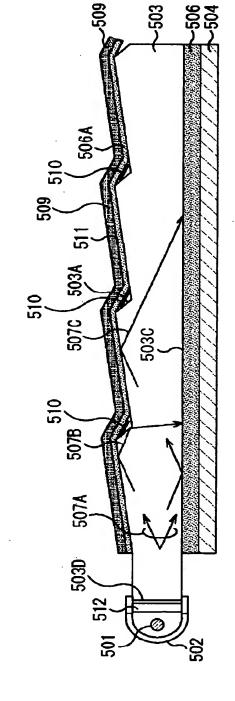


FIG. 97

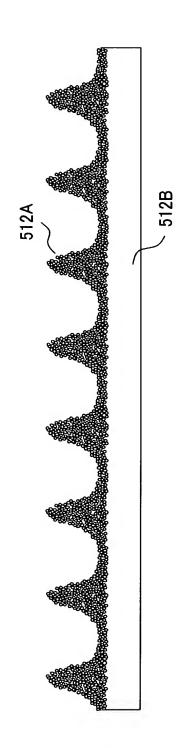


FIG. 93

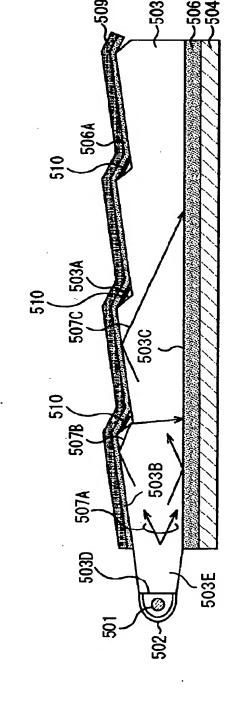
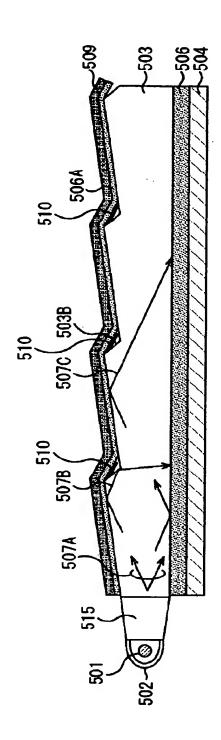


FIG. 99





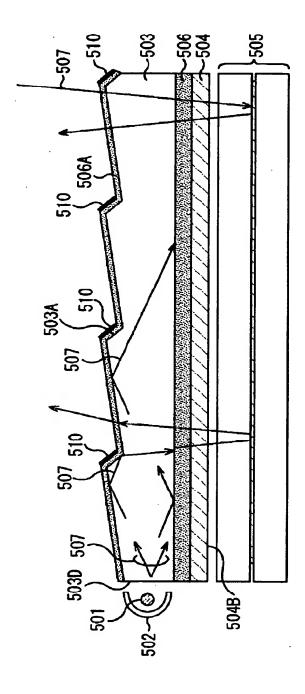


FIG. 10

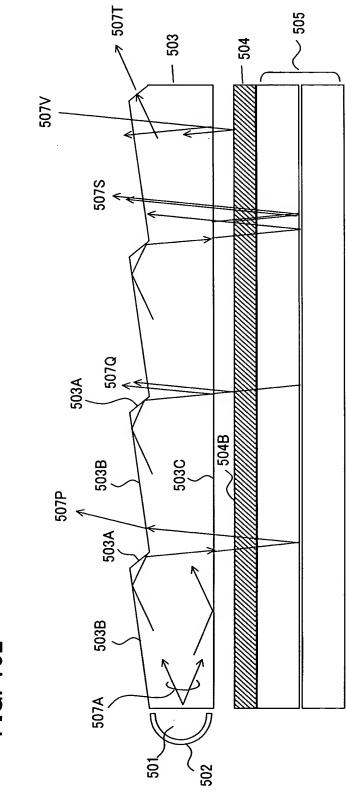
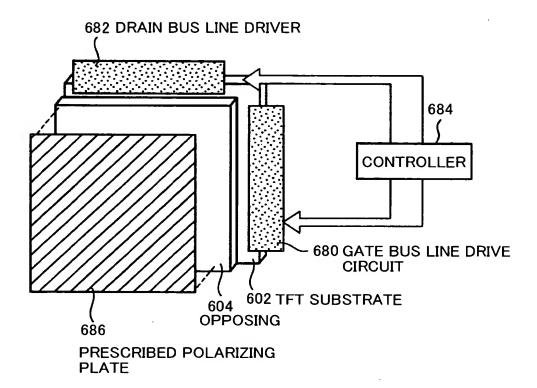


FIG. 102

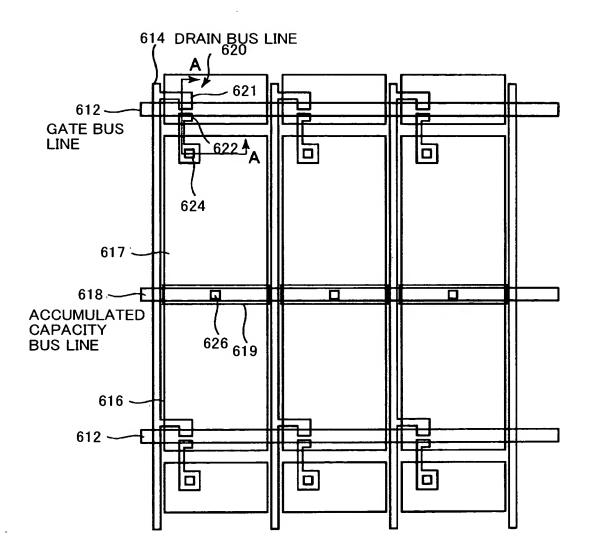
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FIG. 103



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FIG. 104



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FIG. 105

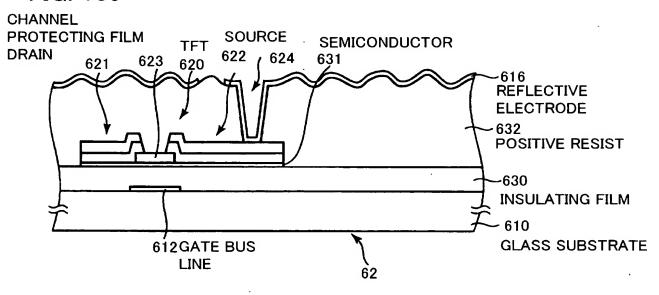
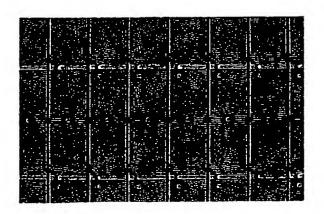


FIG. 106

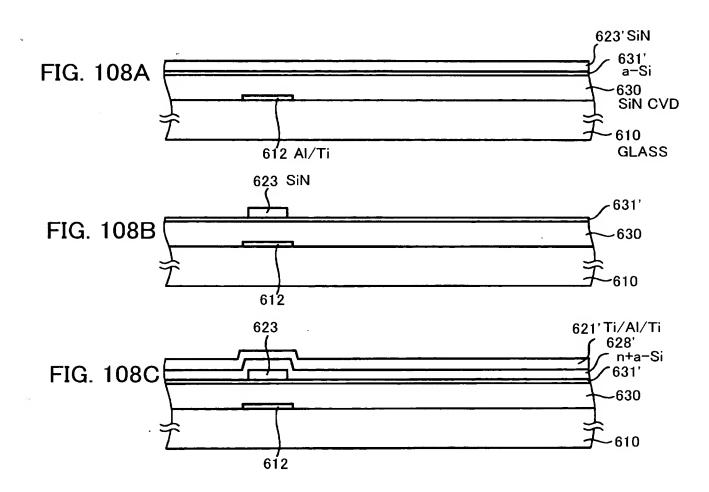


REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 75 of 78 (312) 360 0080

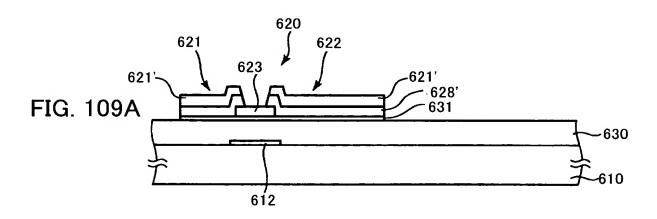
70°C 200sec | 80~130°C 200sec 12mW/cm² 217sec 0 215°C 60min **EMBODIMENT** × | 65mW/cm² 40sec | 12mW/cm² 5~440sec COMPARATIVE EXAMPLE 110°C 200sec 135°C 80min 215°C 60min × 110°C 200sec 215°C 60min 0 **EMBODIMENT 1** 65mW/cm² 40sec 110°C 200sec 135°C 80min 215°C 60min 0 FORMATION OF WRINKLE-SHAPED UNDULATIONS RESISIT COATING BAKING PRIOR TO UV IRRADIATION **UV IRRADIATION** EXPOSURE/ DEVELOPMENT PRE-BAKING **PROCESS** ANNEAL

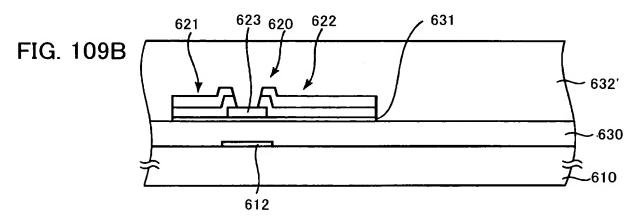
FIG. 10

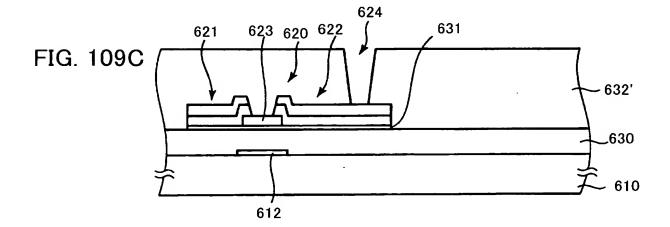
REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 76 of 78 (312) 360 0080



REFLECTION TYPE LIQUID CRYSTAL... Oct. 31, 2003 Itami et al. Greer, Burns & Crain, Ltd. (Patrick Burns) Ref. No. 3408.68664 Sheet 77 of 78 (312) 360 0080







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